8.0 BUILD TRAFFIC CONDITIONS WITH MITIGATION

Results of the Build analysis traffic conditions and the Alternative Build analysis traffic conditions revealed that several intersections will require mitigation in order to accommodate trips generated by the Riverside MUPDD development. These intersections are:

- The Riverhead Traffic Circle (Intersection of CR 94, CR 63, CR 104, SR 24, and Peconic Avenue)
- SR 24 and Old Quogue Road
- SR 24 and Main Street

Two (2) other intersections experience diminished levels of service that may require mitigation. It is, however, likely that mitigation will not be necessary at either intersection if mitigation is implemented at the other three (3) intersections. The two intersections are:

- SR 24 and Downtown Road
- SR 24 and Ludlam Avenue

Typical mitigation for the types of operational service problems encountered at all of the intersections is the installation of a traffic signal. Roundabouts have also become popular for addressing the types of problems involved. Both types of mitigation will be explored, as appropriate.

8.1 Traffic Signal Warrant Analysis

Prior to installing a traffic signal at any intersection, a traffic signal warrant analysis must be conducted to determine if the intersection is eligible to have a traffic signal installed. The Federal Highway Administration (FHWA) and the New York State Department of Transportation (NYSDOT) have both established warranting requirements, or criteria, to determine if traffic conditions at an intersection warrant the installation of a traffic signal. For this study, the FHWA warrants were used because NYSDOT is abandoning its requirements and adopting the FHWA requirements as part of its adoption of the federal *Manual on Uniform Traffic Control Devices for Streets and Highways (2003 Ed.).* New York will adopt this manual as its own on September 13, 2007. As the project will not have been initiated by this date, it is appropriate to use the FHWA warranting requirements.

Traffic signal warrant analyses were performed for each of the intersections that show the potential need for mitigation. No analysis was performed for the Riverhead Traffic Circle, however, since traffic volumes on at least four (4) of the approaches clearly meet warranting requirements. The analyses were done in the manner prescribed in Section 3-3. The results of the analysis are presented on Table 8-1. The individual analyses are shown in Appendix H.

TABLE 8-1: TRAFFIC SIGNAL WARRANT ANALYSIS

Warrant	Description of Warrant	SR 24 & Old Quogue Road Warrant Satisfied	SR 24 & Main Street Warrant Satisfied	SR 24 & Downtown Road Warrant Satisfied	SR 24 & Ludlam Avenue Warrant Satisfied
1	Minimum Vehicular Volumes		X		
	Interruption of Continuous Traffic	X	X		X
	80% Vehicular and Interruption Volumes		X		
2	Four-Hour Vehicular Volumes	X	X		X
3	Peak-Hour Conditions	X	X		X
	Peak-Hour Vehicular Volumes	X	X		X
4	Pedestrian Volumes				
	Pedestrian Volumes - Gaps Same Period				
5	School Crossing Student Volumes				
	School Crossing - Gaps Same Period				
6	Coordinated Signal System - Degree of Platooning				
7	Crash Experience - Adequate Trial of Alternatives				
	Crash Experience - Reported Crashes Susceptible to Correction				
	Crash Experience - 80% Volumes for Warrants 1A, 1B, or 4	X	X		X
8	Roadway Network Weekday Volume				
	Roadway Network Weekend Volume				

Note: Shaded Rows Indicate Warrants Considered Marginal.

8.1.1 Results of the Traffic Signal Warrant Analysis

Riverhead Traffic Circle

No analysis performed. Traffic volumes clearly satisfy warranting requirements.

State Route 24 at Main Street

Traffic conditions at the intersection satisfy Warrants 1, 2, 3, and 7. The intersection is eligible to have a traffic signal installed.

State Route 24 at Old Quogue Road/Rivercatwalk Driveway

The analysis was performed using the Alternative 1 Build condition, since it is probable the Rivercatwalk driveway would be aligned with Old Quogue Road when it is built. Warrants 1, 2, 3, and 7 are satisfied, indicating the intersection is eligible to have a signal installed.

State Route 24 at Ludlam Avenue

Traffic conditions at the intersection satisfy Warrants 1, 2, 3, and 7. The intersection is eligible to have a traffic signal installed.

No mitigation will, however, be further considered within the context of this study. Gaps in the traffic flow would significantly improve at the intersection if mitigation, in the form of a traffic signal, roundabout, or some other device, is implemented at the intersection of SR 24 and Main Street. Levels of service would improve and delays would decrease at Ludlam Avenue as a result of an improvement at Main Street. A traffic signal is, therefore, only recommended at Ludlam Avenue if no mitigation is implemented at Main Street.

State Route 24 at Downtown Road

The intersection fails to satisfy warranting requirements, so no mitigation is recommended. The intersection will, however, benefit from mitigation measures employed at the intersections of SR 24 at Old Quogue Road/Rivercatwalk driveway and

SR 24 at Main Street. Additional benefits will be derived if the Alternative 2 Build roadway extension to CR 104 is constructed.

8.2 Proposed Mitigation Measures

Riverhead Traffic Circle

Mitigation, in the form of a traffic signal, would require a complete reconstruction of the intersection. It also requires the removal of one of the approach legs to the intersection. Figure 8-1 shows a proposed layout for a signal at the intersection. The signal would have to operate as a split phase signal to allow the expanded number of travel lanes to fit within the existing right-of-ways. If the right-of-ways are widened, additional travel lanes could be constructed that would further improve the operation of a traffic signal at the intersection.

The Suffolk County Department of Public Works (SCDPW) has also proposed an improvement to the intersection, independent of the proposed Riverside MUPDD project, that would expand the roundabout to two (2) circulating lanes. The plan, prepared by L.K. McLean Associates, P.C., is shown as Figure 8-2.

SR 24 at Old Quogue Road/Rivercatwalk Driveway

A traffic signal could likely be built within the existing right-of-way at this intersection. Standard signal plans could be developed at the proper time for either a three-way T-intersection or a four-way intersection, with the Rivercatwalk driveway included.

The SCDPW has also developed a two-lane roundabout proposal for this intersection, prepared by L.K. McLean Associates, P.C. It is shown as Figure 8-3. A single-lane roundabout might also be appropriate for this intersection.

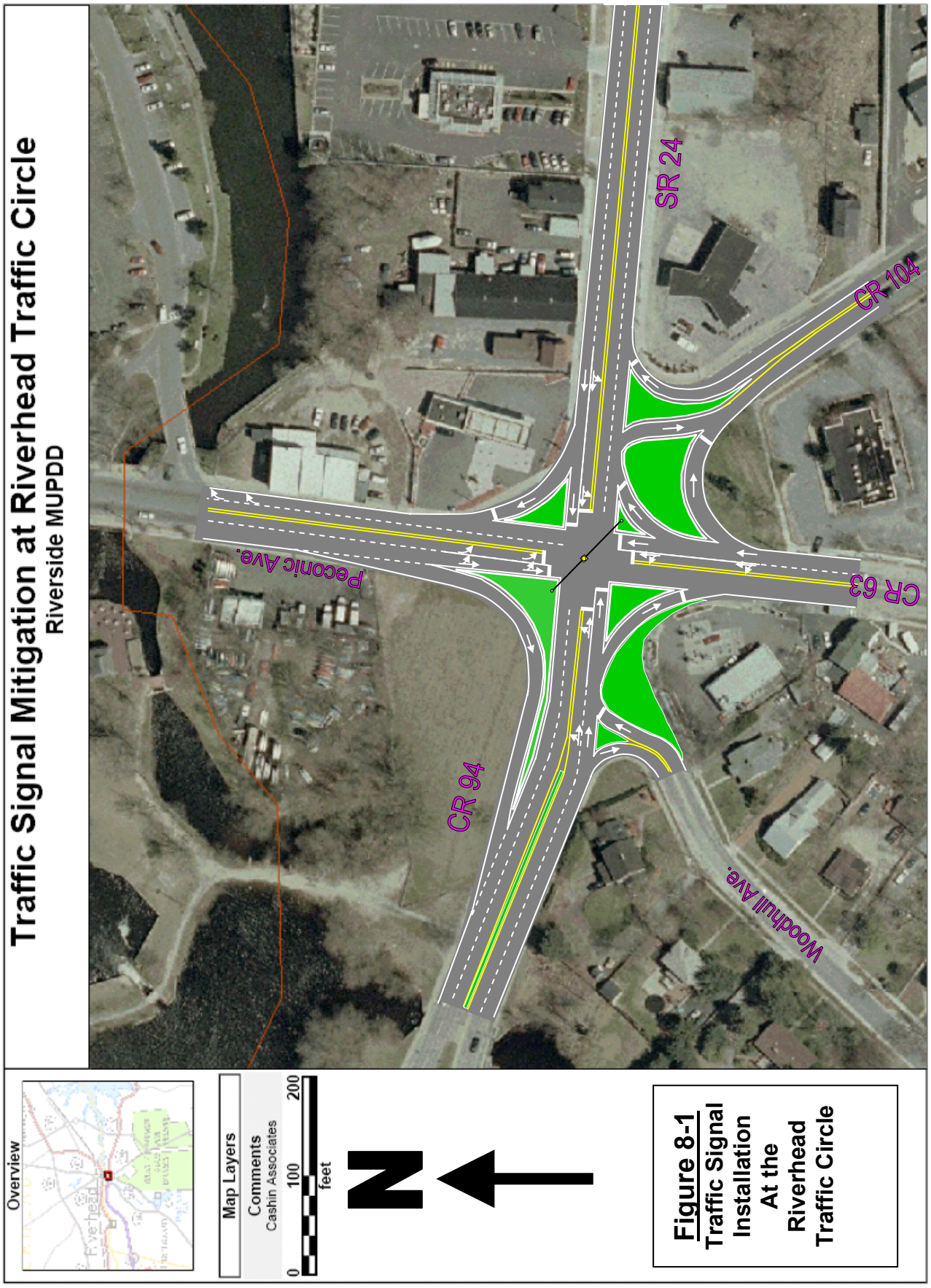
Traffic Signal Mitigation at Riverhead Traffic Circle
Riverside MUPDD
Overview
Riverhead
Map Layers
Comments
Cashin Associates
0
100
200
feet
N
Figure 8-1
Traffic Signal
Installation
At the
Riverhead
Traffic Circle
SR 24
CR 104
CR 63
Peconic Ave.
CR 94
Woodhull Ave.

Figure 8-2
2-Lane Roundabout At Riverhead Traffic Circle

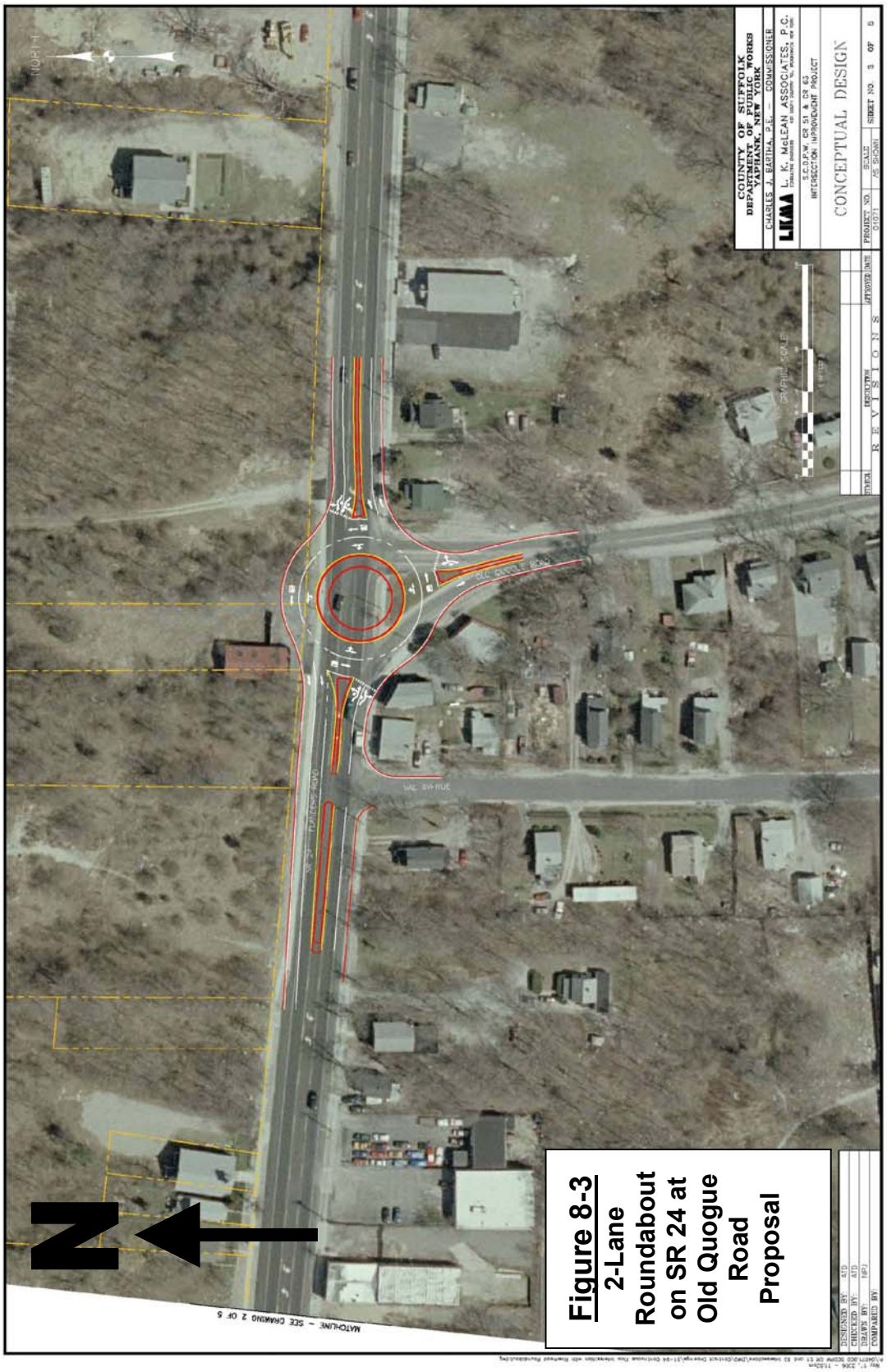

Figure 8-3
2-Lane Roundabout on SR 24 at Old Quogue Road Proposal

SR 24 at Main Street

Similar to the intersection of SR 24 and Old Quogue Road, a traffic signal could likely be built within the existing right-of-way at this intersection. Standard signal plans for a three-way T-intersection could be developed prior to or during construction of the MUPDD project.

A single-lane roundabout might also be appropriate for this intersection. It would be similar in design to that shown on Figure 8-3, but with only one circulating lane.

8.3 Capacity Analysis (Build Scenario with Mitigation)

Capacity Analysis and Levels of Service (LOS) for the Build Scenario with Mitigation

Using the methods described in Section 3.2, and in conformance with the procedures described in the *Highway Capacity Manual 2000 (HCM 2000)*, capacity analyses were performed for each of the intersections needing mitigation for each peak traffic period. The Proposed Action Build condition traffic volumes were used to re-analyze the Riverhead Traffic Circle and the intersection of SR 24 and Main Street. The Alternative 1 Build traffic volumes, with the Rivercatwalk driveway aligned, were used to analyze the intersection of SR 24 and Old Quogue Road/Rivercatwalk driveway. The capacity analysis results and levels of service are presented on Table 8-2. A composite level of service table is also provided as Table 8-3 to allow a comparison between Build and Build with Mitigation scenarios. Additionally, capacity analysis results for individual intersections are provided in Appendix E.

TABLE 8-2: BUILD WITH MITIGATION INTERSECTIONAL LEVELS OF SERVICE

Riverside MUPDD

Intersection	Mitigation	Movement / Approach	Weekday AM Peak Hour				Weekday Midday Peak Hour				Weekday PM Peak Hour				Saturday Midday Peak Hour			
			Overall	LOS	Delay	v/c	Overall	LOS	Delay	v/c	Overall	LOS	Delay	v/c	Overall	LOS	Delay	v/c
Riverhead Traffic Circle (SR 24, CR 94, CR 104, CR 63, & Peconic Avenue Intersection)	Traffic Signal	NB CR 63-LT	E	F	92.0	0.95	E	E	77.0	0.90	F	F	232.0	1.35	F	F	82.2	0.92
		NB CR 63-R		C	31.9	0.35		C	33.3	0.40		C	33.5	0.46		C	34.7	0.50
		WB SR 24-LT		F	88.3	1.04		F	86.0	1.02		F	174.1	1.26		F	257.8	1.45
		WB SR 24-R		B	15.7	0.47		C	23.4	0.71		D	41.5	0.95		B	19.7	0.58
		Peconic-L		F	88.0	1.03		E	68.9	0.95		F	90.5	1.04		D	51.4	0.84
		Peconic-T		E	63.6	0.93		E	73.9	0.97		F	168.6	1.25		F	176.1	1.26
		Peconic-R		B	15.1	0.13		B	14.2	0.09		B	15.1	0.13		B	14.7	0.14
		EB CR 94-LT		E	78.9	1.00		E	75.5	1.00		F	196.2	1.31		F	135.2	1.17
		EB CR 94-R		C	25.7	0.04		C	23.7	0.09		C	26.6	0.12		C	25.9	0.28
	2-Lane Roundabout	NB CR 63	A	A	7.0	0.37	A	A	6.8	0.38	D	B	11.9	0.60	E	A	7.6	0.40
		WB SR 24		A	5.3	0.63		B	13.2	0.05		C	31.8	1.02		B	11.5	0.86
		SB Peconic		B	10.7	0.63		B	10.9	0.67		E	63.9	1.14		D	35.4	0.98
		EB CR 94		A	8.0	0.58		A	8.5	0.65		D	43.8	1.02		F	231.3	1.45
SR 24 (Flanders Road) at Old Quogue Road (Alternative 1 Build)	Traffic Signal	NB-LTR	B	D	42.5	0.29	C	D	47.4	0.76	C	D	48.7	0.72	C	C	34.3	0.38
		WB-L		A	6.7	0.08		B	11.5	0.11		B	15.7	0.04		B	16.7	0.16
		WB-T		B	11.9	0.68		C	24.4	0.84		C	34.2	0.95		C	27.5	0.88
		WB-R		A	5.0	0.04		A	8.9	0.04		A	7.3	0.04		A	9.0	0.05
		SB-L		D	42.2	0.23		C	33.1	0.24		D	37.1	0.32		C	32.9	0.22
		SB-T		D	40.6	0.04		C	31.2	0.04		C	34.6	0.05		C	31.3	0.04
		SB-R		D	41.9	0.21		C	32.6	0.20		D	36.7	0.30		C	32.4	0.18
		EB-L		A	8.0	0.18		B	18.1	0.30		C	23.5	0.37		C	23.8	0.54
		EB-T		B	11.4	0.66		B	19.3	0.73		C	23.0	0.85		C	23.6	0.83
		EB-R		A	4.9	0.02		A	8.9	0.05		A	7.5	0.08		A	9.0	0.06
	2-Lane Roundabout	NB OI Quogue	A	B	11.4	0.08	A	B	13.1	0.37	A	C	20.6	0.41	A	B	14.4	0.26
		WB SR 24		A	2.6	0.35		A	3.3	0.42		A	3.3	0.49		A	3.2	0.43
		SB Rivercat		B	11.5	0.12		B	14.9	0.29		C	29.5	0.51		B	14.1	0.28
		EB SR 24		A	2.7	0.33		A	2.9	0.34		A	2.9	0.43		A	3.1	0.40
	1-Lane Roundabout	NB OI Quogue	A	B	11.0	0.09	A	B	12.7	0.38	B	C	22.4	0.49	A	B	13.8	0.28
		WB SR 24		A	2.7	0.67		A	5.6	0.81		B	15.9	0.97		A	5.4	0.83
		SB Rivercat		B	11.1	0.12		B	14.3	0.33		D	44.2	0.69		B	13.3	0.32
		EB SR 24		A	2.8	0.64		A	3.0	0.65		A	3.6	0.84		A	3.4	0.77
SR 24 (Flanders Road) at Main Street	Traffic Signal	NB-L	A	C	22.1	0.52	B	C	22.0	0.52	B	D	49.3	0.92	B	C	21.2	0.45
		NB-R		C	20.9	0.38		C	21.4	0.43		C	27.3	0.67		C	21.2	0.42
		WB-L		B	10.7	0.47		B	10.6	0.45		C	29.2	0.74		B	13.6	0.51
		WB-T		A	9.0	0.55		A	8.8	0.53		B	12.7	0.74		B	11.2	0.68
		EB-T		A	9.0	0.54		A	9.6	0.58		B	14.0	0.77		B	11.9	0.70
		EB-R		A	0.3	0.18		A	0.2	0.13		A	0.2	0.13		A	0.1	0.09
	1-Lane Roundabout	NB Main St	A	A	9.9	0.45	A	B	10.5	0.48	D	D	51.2	1.01	A	B	11.5	0.47
		WB SR 24		A	5.9	0.74		A	5.3	0.71		E	60.1	1.10		A	5.4	0.80
		EB SR 24		A	4.0	0.71		A	3.4	0.66		A	3.3	0.78		A	2.9	0.66

LOS = Level of Service
Delay = Delay in Seconds/Vehicle
v/c = Demand Flow (Volume) to Capacity Ratio
NB = Northbound, SB = Southbound
EB = Eastbound, WB = Westbound

L=Left
T=Through
R=Right

TABLE 8-3: COMPOSITE BUILD WITH MITIGATION LEVEL OF SERVICE TABLE

Riverside MUPDD

Intersection	Existing Control	Movement / Approach	Weekday AM Peak Hour								Weekday Midday Peak Hour							
			Build		Traffic Signal		2-Lane Round		1-Lane Round		Build		Traffic Signal		2-Lane Round		1-Lane Round	
			Overall	LOS	Overall	LOS	Overall	LOS	Overall	LOS	Overall	LOS	Overall	LOS	Overall	LOS	Overall	LOS
Riverhead Traffic Circle (SR 24, CR 94, CR 104, CR 63, & Peconic Avenue)	Roundabout Stop Signs	NB CR63	F	F	E	E	A	A			F	F	E	E	A	A		
		NWB CR 104		F								F						
		WB SR 24		F		E		A				F		E		B		
		SB Peconic		F		E		B				F		E		B		
		EB CR 94		F		E		A				F		E		A		
SR 24 (Flanders Road) at Old Quogue Road (Alt. 1)	Side Street Stop Signs	NB Ol Quogue	C	C	B	D	A	B	A	B	F	F	C	D	A	B	A	B
		WB SR 24		A		B		A		A		A		C		A		A
		SB Rivercat		C		D		B		B		D		C		B		B
		EB SR 24		B		B		A		A		B		B		A		A
SR 24 at Main Street	Side Street Stop Signs	NB Main St	F	F	A	C			A	A	F	F	B	C			A	B
		WB SR 24		B		A				A		B		A				A
		EB SR 24				A				A				A				A

Intersection	Existing Control	Movement / Approach	Weekday PM Peak Hour								Saturday Midday Peak Hour							
			Build		Traffic Signal		2-Lane Round		1-Lane Round		Build		Traffic Signal		2-Lane Round		1-Lane Round	
			Overall	LOS	Overall	LOS	Overall	LOS	Overall	LOS	Overall	LOS	Overall	LOS	Overall	LOS	Overall	LOS
Riverhead Traffic Circle (SR 24, CR 94, CR 104, CR 63, & Peconic Avenue)	Roundabout Stop Signs	NB CR63	F	F	F	F	D	B			F	F	F	E	E	A		
		NWB CR 104		F								F						
		WB SR 24		F		F		C				F		F		B		
		SB Peconic		F		F		E				F		F		D		
		EB CR 94		F		F		D				F		F		F		
SR 24 (Flanders Road) at Old Quogue Road (Alt. 1)	Side Street Stop Signs	NB Ol Quogue	F	F	C	D	A	C	B	C	F	F	C	C	A	B	A	B
		WB SR 24		B		C		A		B		B		C		A		A
		SB Rivercat		E		D		C		D		F		C		B		B
		EB SR 24		B		C		A		A		B		C		A		A
SR 24 at Main Street	Side Street Stop Signs	NB Main St	F	F	B	D			D	D	F	F	B	C			A	B
		WB SR 24		B		B				E		B		B				A
		EB SR 24				B				A				B				A

LOS = Level of Service
Delay = Delay in Seconds/Vehicle
v/c = Demand Flow (Volume) to Capacity Ratio
NB = Northbound, SB = Southbound
EB = Eastbound, WB = Westbound

L=Left
T=Through
R=Right

8.3.1 Results of Intersection Capacity Analysis (Build with Mitigation Scenario)

Riverhead Traffic Circle

Capacity analysis results showed dramatic improvements in the levels of service at the intersection with a two-lane roundabout constructed. Levels of service improved from Build condition LOS F to LOS A during the weekday morning and mid-day peak traffic periods. Improvements were also realized during the weekday evening and Saturday mid-day peak periods, with operational levels rising from LOS F to LOS D and LOS E, respectively.

It is necessary to bear in mind, however, that the improvements resulting from a two-lane roundabout are theoretical. Other factors impact the successful operation of a two-lane roundabout, such as driver comfort and driver ability. Motorists are not familiar with two-lane roundabouts and may have difficulties executing the merging, weaving, and diverging movements required when entering and departing the roundabout. The analysis also assumes that motorists driving on the inner circle will continue to circulate until a gap opens on the outer circle for them to safely merge to the outer lane before exiting at their departure points. This is not a probable occurrence when motorists are rushing to work or other destinations. Still, while the two-lane roundabout will not operate as well as the analysis suggests, it will operate more efficiently than the single-lane roundabout that currently exists.

Installation of a traffic signal will also produce benefits over the single-lane roundabout, but not to the degree of the two-lane roundabout. Operational levels will improve to LOS E during the morning and mid-day peak traffic periods. The intersection would remain at a LOS F during the evening and Saturday peak periods, but with vastly diminished delays on the approaches to the intersection. In effect, future Build traffic conditions at the intersection would be about the same, or slightly better, than presently exist. Despite the poor levels of service that the analysis portrayed, a traffic signal is a viable alternative at the intersection because drivers are familiar with the operations of traffic signals and a signal would produce better results during the off-peak periods than the roundabout that

now exists. If additional right-of-way width can be acquired to add travel lanes on the approaches, signal phasing can be altered away from the proposed split-phase timing to improve efficiency and reduce delays even further.

SR 24 at Old Quogue Road/Rivercatwalk Driveway

Capacity analysis showed that either a traffic signal or a roundabout would be effective in mitigating Build condition traffic delays at the intersection, with a single-lane roundabout being the preferred alternative. A traffic signal would yield acceptable LOS B or LOS C operations during all peak traffic periods. The roundabouts, either single-lane or double-lane, would generally produce LOS A during all peak periods, except that the single-lane roundabout would have a slightly reduced LOS B during the evening peak period.

A single-lane roundabout is probably a better choice than the double-lane one because drivers can more easily negotiate the conditions. The analysis results are also more reliable for a single-lane roundabout. Additionally, a single-lane roundabout requires less right-of-way width, is more aesthetically pleasing, and can provide a gateway to the Rivercatwalk site.

State Route 24 at Main Street

Similar to the intersection of SR 24 and Old Quogue Road/Rivercatwalk driveway, the intersection will improve to LOS A or LOS B during most peak periods with either a traffic signal or single-lane roundabout. Only the evening peak period will sustain some delays, with a LOS D, if a roundabout is installed. A two-lane roundabout was not evaluated, since it was determined to be unnecessary. Again, a roundabout may be preferred for its aesthetic benefits.

8.4 Conclusions on Build Traffic Condition Mitigation Measures

1. Construction of a two-lane roundabout at the Riverhead Traffic Circle will produce substantial improvements to levels of service and significant reductions in delay, but probably not to the extent portrayed in the capacity analysis results. Other factors, like driver familiarity, comfort, and ability, would impact operational conditions and diminish the overall levels of service. Still, the two-lane roundabout would be a major improvement over the roundabout that currently exists.

2. Installation of a traffic signal at the intersection where the Riverhead Traffic Circle now lays would also improve levels of service and reduce delays, but not to the degree that a two-lane roundabout theoretically would. A signal would improve future Build traffic conditions to a level similar to, or slightly better than, currently exists. A signal remains a viable option, however, as drivers are familiar with its operation and it is more easily modified if additional travel lanes are provided in the future.

3. A traffic signal or a single-lane roundabout would produce significant benefits at the intersection of SR 24 and Old Quogue Road/Rivercatwalk driveway, returning the intersection to a condition with good levels of service and minimal delays. A two-lane roundabout would also work well, but the extra lane would be superfluous. A single-lane roundabout is preferred because of its aesthetic advantages and it does not delay motorists during off-peak traffic periods.

4. Similar benefits are derived from either a traffic signal or single-lane roundabout at the intersection of SR 24 and Main Street. Either would produce good levels of service with minimal delays and negate the impacts of site-generated traffic.

5. The intersection of SR 24 and Ludlam Avenue satisfies warranting requirements for the installation of a traffic signal, but no mitigation is recommended for the

intersection. The intersection will enjoy gaps in the traffic flows created by the mitigation employed at the intersection of SR 24 and Main Street, thereby eliminating the need to engage in any remedial measures at this intersection.

6. The intersection of SR 24 and Downtown Road does not satisfy warranting requirements for installation of a signal. Notwithstanding, the intersection will gain benefits from the mitigation actions put into operation at the intersections of SR 24 at Old Quogue Road/Rivercatwalk driveway and SR 24 at Main Street.

7. Construct left and right hand turning lanes at traffic lights.